point in the constellation of *Perseus*. If one should call the Algol stars Perseids, after the oldest representative, *β Persei*, then everyone would immediately recognize the incorrectness of the designation. The name Cepheid is, in quite the same way, incorrect and misleading. The name Cluster Star, taken up in America, is also not suitable, because this kind of a variation is not a general property of the stars in clusters, and not even of all the variables in clusters, and not all the stars having this kind of variation are located in clusters. For the present it is not possible to establish with certainty a class distinction expressed in length of period, even tho there seem to be short-period groups and long-period groups. Therefore these stars, with their great regularity, their sudden, rapid rise to maximum and their slow decrease, can be placed together under the common name of "Blinksterne." If the stars U *Geminorum*, SS *Cygni* and SS *Aurigæ* were regular in the times of their brightening, then they would be true examples of antalgol stars, because their increase of light comes after long periods of constant light.

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Some Electric Furnace Experiments on the Emission of Enhanced Lines in Hydrogen Atmosphere.[1]

A very interesting paper with the above title by Arthur S. King is soon to appear in the *Contributions from the Mount Wilson Solar Observatory*. Dr. King has kindly furnished a manuscript copy to be abstracted for this issue of the *Publications*.

The experiments discussed in this paper were undertaken to test the hypothesis that the presence of hydrogen may facilitate the emission by metallic vapors of the so-called enhanced lines. This hypothesis was first suggested by the fact that the arc in a hydrogen atmosphere shows the enhanced lines stronger than in air. It is also known, however, that, for the same distance between terminals, the arc is maintained with greater difficulty in an atmosphere of hydrogen than in air and that the discharge is characterized by a higher potential gradient, indicating an approach to the conditions of the spark discharge.

[1] Abstract by E. S. Haynes.

The question is thus raised whether the action of hydrogen in producing from the arc those lines which are intensified in the spectrum of the spark is not simply to alter the conditions of the arc discharge toward those of the spark.

The electric furnace seems especially adapted to test this question, because the graphite tube of the furnace may be expected to perform its functions as an exciting source independently, to a large extent, of the surrounding gas, leaving the conditions of mixed vapors, density and total pressure to produce any effects that may be observed.

Dr. KING gives the following summary of the results of his work with the electric furnace:—

1. The experiments "have failed to show any effect of a hydrogen atmosphere in strengthening enhanced lines. They appear in the furnace at low pressure with equal ease whether hydrogen is present or the furnace contains a residue of air.

2. "Widely different amounts of titanium vapor at low pressure and the same temperature have shown no material effect on the relative intensities of enhanced lines.

3. "Increasing the pressure of hydrogen, the temperature being held as nearly constant as possible, causes a progressive weakening of the titanium enhanced lines, until at atmospheric pressure only traces of the strongest are visible in the furnace spectrum."

It is thus seen that neither the presence of hydrogen nor the density of the radiating vapor materially affects the strength of the enhanced lines, but that the total pressure is very important in this respect. Previous experiments have shown that the arc lines are not thus affected by the pressure; but experiments with the furnace, the tube arc and the ordinary arc at low pressures have shown that the enhanced lines are brought out best in a partial vacuum, a condition favorable to all the phenomena of electro-luminescence.

Since the occurrence of enhanced lines in stellar spectra is usually accompanied by strong hydrogen emission, it has been suggested that the enhancement is due in some unknown manner to the presence of the hydrogen. The present experiments render this view improbable. The probable manner of the production of enhanced lines in stellar atmospheres appears

much clearer since the discharge of electrons from hot bodies has been investigated for the relatively low temperatures of the electric furnace, this action having been shown to persist at very high pressures. The high stellar temperatures, especially when combined with low pressure, may thus be expected to duplicate the electronic speeds obtained in the arc and spark by steep potential gradients, a condition established by much evidence as favorable to the enhanced lines.

The enhanced lines in the chromosphere would thus seem to be due to the rarefied conditions at these levels of the solar atmosphere, which would allow a high speed to be retained by the electrons expelled by the heated matter below. The strength of the enhanced lines would also seem to be a valuable criterion as to the temperatures prevailing in stars and in different regions of the solar photosphere at levels where the electrified particles are produced. Thus the reduced strength of enhanced lines in sun-spot spectra seems valid evidence of a lower temperature for the photosphere of those regions, since such a reduced temperature, the pressure being assumed essentially the same, would result in the production of lower-speed electrons.

VOLUME VII, PUBLICATIONS OF THE LICK OBSERVATORY.

This volume, whose title is "Contributions of the Berkeley Astronomical Department (Students' Observatory), University of California, I," is now being distributed to the correspondents of the Lick Observatory. It comprises ten parts, seven of which are devoted to the exposition of LEUSCHNER's Short Methods of Determining Orbits, and to practical applications of these methods to the computation of the orbits of comets, asteroids and satellites. The theoretical papers are by Professor A. O. LEUSCHNER, while the chapters giving the practical applications are by Professor R. T. CRAWFORD, and by assistants and students in the Students' Observatory.

The volume also contains a paper "On Astronomical Refraction" by Professor CRAWFORD, and two papers by Dr. B. L. NEWKIRK entitled, respectively, "Tables for the Reduction of Photographic Measures" and "Investigation of the Repsold Measuring Apparatus."